

WHAT IS CLAIMED IS:

1. A variable gain circuit comprising:
a variable gain amplifier which receives an input
signal, outputs an amplified signal, and includes a
first field-effect transistor;

5 a gain control signal compensation circuit which
outputs a gain control signal for controlling a gain of
said variable gain amplifier and includes a second
field-effect transistor; and

10 a gain deviation correction circuit which corrects
a gain deviation based on said variable gain amplifier
and said gain control signal compensation circuit.

15 2. The circuit according to claim 1, wherein said
first variable gain amplifier comprises multi-stage
amplifiers.

20 3. The circuit according to claim 1, which
further comprises a gain control signal converter which
converts an external gain control signal into an
internal gain control signal, said variable gain
amplifier including the first field-effect transistor
is a first variable gain amplifier, the first gain
control signal is a first gain control signal, said
gain control signal compensation circuit including the
second field-effect transistor is a first gain control
25 signal compensation circuit, said gain deviation
correction circuit includes a second gain control
signal compensation circuit and a second variable gain

amplifier, and said first gain control signal compensation circuit converts the internal gain control signal into the first gain control signal and inputs the first gain control signal to said first variable gain amplifier to control gain of said first variable gain amplifier, and said second gain control signal compensation circuit converts the internal gain control signal into the second gain control signal and inputs the second gain control signal to said second variable gain amplifier to control gain of said second variable gain amplifier.

2. The circuit according to claim 1, wherein said first variable gain amplifier comprises multi-stage amplifiers.

3. The circuit according to claim 1, wherein said second gain control signal compensation circuit comprises a circuit obtained by cascading a first gain control signal compensation circuit unit having a structure equivalent to that of said first gain control signal compensation circuit, a voltage/current converter unit, and a second gain control signal compensation circuit unit having an arrangement equivalent to that of said first gain control signal compensation circuit.

4. The circuit according to claim 3, wherein said first variable gain amplifier comprises multi-stage amplifiers.

5 1. The circuit according to claim 5, wherein said voltage/current converter unit converts the first gain control signal V_{z1} into a current signal I_{z1} according to $I_{z1} = f(V_{z1})$, where I_{z1} is an output current to be input to said second gain control signal compensation circuit unit, f is a function.

6 2. The circuit according to claim 1, wherein said first variable gain amplifier comprises multi-stage amplifiers.

10 9. The circuit according to claim 1, which further comprises a gain control signal converter which converts an external gain control signal into an internal gain control signal, said variable gain amplifier including the first field-effect transistor is a first variable gain amplifier, said gain control signal compensation circuit including the second field-effect transistor is a first gain control signal compensation circuit, said gain deviation correction circuit includes a second gain control signal compensation circuit and a second variable gain amplifier, said first gain control signal compensation circuit converts the internal gain control signal into a first gain control signal, said second gain control signal compensation circuit converts the first gain control signal into a second gain control signal, and the first gain control signal is input to said first variable gain amplifier to control a gain of said first

variable gain amplifier, and the second gain control signal is input to said second variable gain amplifier to control a gain of said second variable gain amplifier.

8 ~~16~~. The circuit according to claim ⁷~~8~~, wherein said first variable gain amplifier comprises multi-stage amplifiers.

9 ~~11~~. The circuit according to claim ⁷~~9~~, wherein said second gain control signal compensation circuit comprises a circuit obtained by cascading a voltage/current converter unit connected to an output of said first gain control signal compensation circuit, and a gain control signal compensation circuit unit having a structure equivalent to that of said first gain control signal compensation circuit.

10 ~~16~~. The circuit according to claim ⁹~~11~~, wherein said first variable gain amplifier comprises multi-stage amplifiers.

11 ~~18~~. The circuit according to claim ⁹~~11~~, wherein said voltage/current converter unit converts the first gain control signal V_{z1} into a current signal I_{z1} according to $I_{z1} = f(V_{z1})$, where I_{z1} is an output current to be input to said second gain control signal compensation circuit unit, f is a function.

12 ~~14~~. The circuit according to claim ¹¹~~13~~, wherein said first variable gain amplifier comprises multi-stage amplifiers.

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~~15.~~ A variable gain circuit comprising:

a first variable gain amplifier which receives an input signal, outputs an amplified signal, and includes a first field-effect transistor;

5 a second variable gain amplifier which receives the amplified signal, outputs an amplified output signal, and includes a second field-effect transistor;

10 a first gain control signal compensation circuit which outputs a first gain control signal for controlling a gain of said first variable gain amplifier and includes a third field-effect transistor;

15 a second gain control signal compensation circuit which outputs a second gain control signal for controlling a gain of said second variable gain amplifier; and

20 a third gain control signal compensation circuit which receives an externally supplied external gain control signal, converts the external gain control signal into an internal gain control signal, and outputs the internal gain control signal to said first and second gain control signal compensation circuits.

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~~16.~~ A variable gain circuit comprising:

25 a first variable gain amplifier which receives an input signal, outputs an amplified signal, and includes a first field-effect transistor;

a second variable gain amplifier which receives the amplified signal, outputs an amplified output

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signal, and includes a second field-effect transistor;

a first gain control signal compensation circuit which outputs a first gain control signal for controlling a gain of said first variable gain

5 amplifier and includes a third field-effect transistor;

a second gain control signal compensation circuit which receives the first gain control signal and outputs a second gain control signal for controlling a gain of said second variable gain amplifier; and

10 a third gain control signal compensation circuit which receives an externally supplied external gain control signal, converts the external gain control signal into an internal gain control signal, and outputs the internal gain control signal to said first gain control signal compensation circuit.

15 ~~15~~ ¹⁴. The circuit according to claim ~~16~~, wherein said second gain control signal compensation circuit and said second variable gain amplifier compensate a gain deviation caused when the first field-effect transistor of said first variable gain amplifier and the third field-effect transistor of said first gain control signal compensation circuit operate in a strong inversion region.

20 ~~16~~ ¹⁴ ~~18~~. The circuit according to claim ~~16~~, wherein said third gain control signal compensation circuit compensates a gain deviation caused when the first field-effect transistor of said first variable gain

amplifier and the third field-effect transistor of said first gain control signal compensation circuit operate in a weak inversion region.

17 ¹⁴ 18. The circuit according to claim ~~16~~, wherein
5 said first variable gain amplifier includes a first pair of field-effect transistors, the first gain control signal being input between gate terminals of the first pair of field-effect transistors, source terminals of the first pair of field-effect transistors
10 being commonly connected and grounded through a first current source including the input signal, and said second variable gain amplifier includes a second pair of field-effect transistors, the second gain control signal being input between gate terminals of the second pair of field-effect transistors, source terminals of the second pair of field-effect transistors being
15 commonly connected and grounded through a second current source including the amplified signal.

18 ¹⁴ 20. The circuit according to claim ~~16~~, wherein
20 said first gain control signal compensation circuit includes a first pair of field-effect transistors, the internal gain control signal being input between gate terminals of the first pair of field-effect transistors, source terminals of the first pair of field-effect
25 transistors being commonly connected and grounded through a first current source including a given current, and said second gain control signal

compensation circuit includes a voltage/current converter represented by $I_{z1} = f(V_{z1})$ where f indicates a function and V_{z1} indicates the amplified signal of said first variable gain amplifier and a second pair of field-effect transistors, the second gain control signal being input between gate terminals of the second pair of field-effect transistors, source terminals of the second pair of field-effect transistors being commonly connected and grounded through a second current source including the amplified signal, and a drain terminal of one of the second pair of field-effect transistors being connected to said voltage/current converter.

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